Five-Year Review Report

First Five-Year Review Report
for
Vancouver Water Station #1 & #4
City of Vancouver
Vancouver, Washington

September 2003

PREPARED BY:
United States Environmental Protection Agency
Region 10

Approved by:

//s//
Michael F. Gearheard, Director
Environmental Cleanup Division
US EPA Region 10

September 11, 2003
Date

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
CFR	Code of Federal Regulations
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCE	tetrachloroethene
PRP	Potentially Responsible Party
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TCE	trichloroethene
VOC	volatile organic compound
WS1	Vancouver Water Station 1
WS4	Vancouver Water Station 4

Executive Summary

The remedy for the Vancouver Water Station #1 (WS1) & Water Station #4 (WS4) Superfund Sites in Vancouver, Washington involved selection of an existing air stripping treatment system that reduced tetrachloroethene (PCE) concentrations in drinking water to below the State and Federal Maximum Contaminant Level (MCL). The continued operation of the existing treatment systems along with monitoring, by the City of Vancouver, is the selected final remedial action for both WS1 and WS4. The City of Vancouver has performed the remedy required in both the WS1 and WS4 Record of Decision (ROD) and incurred all costs associated with the installation and operation of the air stripping treatment systems for WS1 and WS4. The trigger for this five-year review is the signing of the ROD for WS1 in September 1998.

The assessment of this five-year review found that the remedy is operating in accordance with the requirements of the ROD. The remedy is functioning as designed. Operation, maintenance and monitoring at the Site are being performed in accordance with the approved Operation and Maintenance Plan. The immediate threats have been addressed and the remedy is protective of human health and the environment.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Vancouver Water Station #1 (WS1) & Water Station #4 (WS4)

EPA ID *(from WasteLAN)*:(WS1) WAD988519708, (WS4) WAD988475158

Region: 10	**State:** WA	**City/County:** Clark

SITE STATUS

NPL status: ☐x Final ☐ Deleted ☐ Other (specify)_____

Remediation status (choose all that apply): Under Construction x Operating Complete

Multiple OUs?* YES xNO	**Construction completion date:** 9/25/98

Has site been put into reuse? X YES NO

REVIEW STATUS

Lead agency: ☐X EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Nancy Harney/Ravi Sanga

Author title: RPM	**Author affiliation:** US EPA Region 10

Review period:**

Date(s) of site inspection: July 1, 2003

Type of review:

X☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: X 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering action:

☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____
☐ Construction Completion ☐ Previous Five-Year Review Report
x Other (specify) 5 years have elapsed since signing of ROD

Triggering action date *(from WasteLAN)*: WS1 9/11/98, WS4 9/1/99

Due date *(five years after triggering action date)*: 9 / 11 /03

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues: NONE

Recommendations and Follow-up Actions: TCE and 1,4 - Dioxane monitoring

Protectiveness Statement(s):

All immediate threats at the Vancouver Water Station 1 & 4 Site have been addressed, and the remedy is protective of human health and the environment.

Other Comments:

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Vancouver Water Station 1 & 4 Superfund Sites
Vancouver, WA
First Five Year Review Report

I. Introduction

The purpose of a five year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five year Review reports. In addition, Five year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The Agency is preparing this Five year Review report pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (EPA), Region 10, conducted the five year review of the remedy implemented at Vancouver Water Stations #1 & #4 Superfund Sites in Vancouver, Washington. This review was conducted by the Remedial Project Manager (RPM) for the Site from April 2003 through September 2003. This report documents the results of the review.

This is the first five year review for the Vancouver Water Stations #1 & #4 Superfund Sites. The triggering action for this statutory review was the completion of the first five years following signature of the ROD for WS1 in 1998. This five year review addresses both WS1 and WS4 since they are similar in nature and location. The five year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events Vancouver Water Station 1 (WS1)

Event	Date
EPA monitoring detected PCE contamination in WS1 (and WS4)	March 1988
City of Vancouver notified public of PCE groundwater contamination at both WS1 and WS4	Feb 1989
EPA proposed MCL for PCE (5 μg/L)	May 1989
EPA initiated investigations for PCE sources near WS1	August 1989
EPA Issued final MCL for PCE (5 μg/L)	Jan 1991
City of Vancouver expanded monitoring at WS1 to include weekly PCE analysis	1991
EPA conducted a hydrogeologic assessment of the Vancouver area and installed 5 GW monitoring wells near WS1.	Fall 1992
City of Vancouver installed 5 air stripping towers at WS1	May 1993
Vancouver WS1 was proposed for the NPL	June 1993
EPA evaluated WS1 for potential removal actions	1993
WS1 Officially placed on the NPL	June 1994
WDOH/ATSDR Preliminary Public Health Assessment concludes that no apparent human health hazard exists from drinking water at WS1	Fall 1994
EPA postponed further investigations due to funding constraints	Fall 1994
EPA samples GW at all 5 monitoring wells at WS1	July 1997
EPA initiates WS1 RI/FS	November 1997
EPA released final RI/FS report	July 1998
EPA released the proposed plan	July 1998
WS1 ROD signed	September 1998
Air stripping remedy continues	1993-present

Table 2: Chronology of Site Events Vancouver Water Station 4 (WS4)

Event	Date
EPA monitoring detected PCE contamination in WS1 and WS4	March 1988
City of Vancouver notified public of PCE groundwater contamination at both WS1 and WS4	Feb 1989
EPA/City began sampling in the vicinity of WS4	1989
4 highest contaminated WS4 wells taken out of service	April 1989
EPA proposed MCL for PCE (5 μg/L)	May 1989
City of Vancouver initiated field investigations for potential PCE sources	July 1989
EPA initiated investigations for PCE sources	August 1989
City of Vancouver removed WS4 from service	Nov 1989
EPA Issued final MCL for PCE (5 μg/L)	Jan 1991
Redesigned air stripping system put into place for WS4	Jan 1992
NPL listed WS4, due to groundwater PCE	October 1992
Preliminary health assessment for WS4 released for public comment	April 1993
EPA postponed investigations on WS4 due to lack of funding	September 1993
EPA resumes work on WS4 investigation	November 1997
EPA conducts Final Remedial Investigation for WS4	1998
EPA releases final RI/FS report for WS4	May 1999
Proposed plan for WS4 published	May 1999
WS4 ROD Signed	September 1999
Air stripping remedy continues	1999-present

II. Background

Physical Characteristics

Vancouver Water Station 1

Vancouver Water Station #1 (WS1) has been owned by the City of Vancouver for over 60 years. WS1 lies within Waterworks Park in the city of Vancouver, Washington, near the center of the city, approximately 0.75 miles east of Interstate 5 and approximately two miles north of the Columbia River. The site is adjacent to commercial districts as well as residential areas. WS1 is a public water supply wellfield made up of ten production wells, five air stripping towers and a holding reservoir used to provide storage capacity to accommodate daily fluctuations in water demand.

Vancouver Water Station 4

Vancouver Water Station 4 (WS4) is also a public water supply wellfield in the City of Vancouver, Washington and is located approximately ½ mile north of the Columbia River. The wellfield has been owned by the City for over 50 years. The site is defined as the wellfield, which encompasses approximately ½ acre and includes several support buildings, six production wells, two air stripping towers, and one capped well.

Land and Resource Use

Vancouver Water Station 1

Water from WS1 is blended together with water from several other wellfields to provide drinking water to the Vancouver region. The combined water supply system provides drinking water to approximately 150,000 people throughout the Vancouver area. Approximately half of the total water system production is supplied by WS1. The upper portion of the aquifer from which WS1 draws its water is approximately 200 feet below ground surface and supplies water to several municipal wellfields and an unknown number of private wells. All known private wells are used for irrigation or filling swimming pools. None of the private wells are known to be used for drinking water.

Vancouver Water Station 4

Similar to WS1, water from WS4 is also blended together with water from several other wellfields to provide drinking water to the Vancouver region. Water from WS4 is primarily used to meet peak demands for water with the largest volumes pumped during the summer. Until the discovery that the groundwater was contaminated with tetrachloroethene (PCE), WS4 provided about 25% of the public water supply for the city of Vancouver. Only two of the wells, with the lowest contamination, have been used since 1989.

Initial Investigation

When the federal Safe Drinking Water Act (SDWA) was amended to require suppliers of public drinking water to monitor for volatile organic compounds (VOCs), the City of Vancouver began monitoring water from WS1 and WS4. Results of this monitoring, which began in March 1988, indicated a persistent presence of (PCE) in the water at WS1 and WS4. In February 1989, in consultation with the Washington State Department of Health (WDOH), the City notified the public of the presence of PCE in the groundwater at both WS1 and WS4. Because PCE concentrations at WS1 were much lower than those at WS4, the notice stated that WS1 water was being blended with WS4 water to reduce overall PCE concentrations.

Historical Sources of Contamination

Vancouver Water Station 1

In July 1989, the City of Vancouver initiated field investigations to determine if there was a source or sources of PCE or other VOCs near WS1. A soil-gas survey was conducted in the WS1 area, and 19 soil-gas samples were collected and analyzed. In addition, groundwater samples were collected from five existing private wells located within a 1-mile radius of WS1. From this data, there was no pattern in soil or groundwater results that indicated a source of PCE. Since the wellfield PCE concentrations were relatively low and suspected source areas were absent, no additional wells were installed at WS1 in an attempt to identify a PCE plume.

In August 1989, EPA Region 10 began a study that included soil-gas and groundwater monitoring in another attempt to identify potential sources of PCE detected at WS1 and several other Vancouver water stations. Eight groundwater samples were collected from production wells at WS1 and Water Station 3 (located approximately 1 mile northwest of WS1) and from private wells within approximately a 1-mile radius of WS1. A total of 194 soil-gas samples were collected throughout the city of Vancouver during the 1989 study, with 20 of the samples collected in the vicinity of WS1.

In February and March of 1990, 100 additional soil-gas samples were collected from 40 locations north and east of the site in order to try and identify potential PCE sources within the vicinity of WS1. To provide soil-gas depth profiles, multiple soil-gas samples were collected from each sampling location and analyzed in the field for VOCs.

Both the 1989 and 1990 phases of the investigation failed to identify a potential source of PCE entering WS1. PCE was detected in soil gas samples collected just north of the WS1, although the concentrations were not high enough to indicate that the area was responsible for the contaminated groundwater at WS1. Groundwater monitoring wells in and adjacent to the wellfield never showed concentrations of PCE above the MCL. Because significant PCE concentrations were not detected except in production wells and those concentrations were either below or just above the MCLs, it made it difficult to identify any historical sources of PCE to WS1.

As a result, the RI/FS did not focus on source identification, EPA believed that along with the

high cost of a source investigation and if a significant source could of been identified it may have been likely that a similar remedial action would have been proposed (such as pump and treat). Therefore, no additional active investigation into potential sources for WS1 were conducted.

Vancouver Water Station 4

Since 1991, PCE was detected in every deep monitoring well near WS4 and sustained PCE concentrations measured at WS4 and PW-2, a private well located approximately 200 yards northeast and upgradient of the wellfield, were many times greater than the maximum concentration measured at any monitoring well in the vicinity. However, no source primarily responsible for the sustained high concentrations of PCE measured at WS4 was identified. A significant reduction of groundwater PCE concentrations prior to 1998 strongly supported the conclusion that there was no on going source of PCE contamination in the area, see figures 12-21 in appendix C.

A baseline PRP search for PCE sources of contamination of groundwater in Vancouver, WA, affecting WS4 was begun by EPA civil investigators in November 1991 and was terminated, due to funding constraints, prior to completion in March 1993. The EPA investigation explored historic uses of PCE and PCE disposal practices. Although multiple sources of PCE (e.g., dry cleaners) may have been present in the area around WS4, no source was identified that was primarily responsible for the sustained high concentrations and for which any additional source control cleanup action could be taken. The results of the PRP search led to the conclusion that while the dry cleaners on the plateau may have contributed to some PCE in groundwater, there was a strong likelihood that there were other sources that were responsible for the big increase in PCE levels detected in 1992/93. While the extent of the high-concentration PCE plume was not known, the significant reduction of PCE in production, monitoring and private wells prior to 1999, indicated that there was not an on-going source of PCE contamination near WS4.

Basis for Taking Action

Vancouver Water Station 1

Monitoring of the WS1 production wells, in 1991 through 1992, showed a trend of continuing and possibly increasing concentrations of PCE (Appendix C). Although the monitoring showed that the PCE concentrations in the combined output at WS1 measured at the reservoir remained below the PCE drinking water MCL of 5 μg/L, the concentrations in a few wells were consistently above the MCL. To effectively remove PCE from the drinking water supply, the City of Vancouver installed five air stripping towers in 1993 at WS1. Although the air stripping system was effectively removing PCE from the water that Vancouver distributed for drinking water, in June 1993, EPA proposed WS1 for listing on the NPL because of PCE in the groundwater. The maximum detected PCE concentration in 1993 was 30 ppb (6/28/93). WS1 was officially placed on the NPL June 1994.

Results of the WS1 baseline risk assessment indicated that human health risks were within the

NCP acceptable risk range. However, because groundwater was shown to have persistent concentrations of PCE above the MCL, it was still necessary to take remedial action at WS1 since the NCP requires that MCLs be met both in the groundwater and the tap.

Vancouver Water Station 4

In 1988, the City of Vancouver monitored the water at the six wells of WS4 weekly and discovered PCE in the groundwater. The City used the results of the weekly groundwater monitoring to determine which wells to use for drinking water production to ensure that the concentration of PCE in the drinking water delivered to its customers was as low as possible. In November 1989, all the wells of WS4 were removed from service and an active air stripping system was installed. Although the air stripping system effectively removed PCE from distributed drinking water, groundwater PCE concentrations remained above the MCL and WS4 was listed on the NPL in 1992.

Similar to WS1, the results of the baseline risk assessment for WS4 were within the NCP acceptable risk range. However, groundwater PCE concentrations were above the MCL and remedial action was necessary to prevent the possibility of imminent and substantial endangerment to public health.

IV. Remedial Actions

Remedy Selection

Vancouver Water Station 1

EPA's selected remedy at WS1 was to continue operation of the City of Vancouver's air-stripping system for the groundwater at WS1 that was used as a public drinking water supply. With air stripping, water to be treated trickles down a packed column in a tower, which breaks the flow of water, creating as much surface area as possible. After breaking the flow of water, large volumes of air, forced through the process of evaporation, transfer the contaminants from the water. The air is then treated through carbon filtration, which adsorb contaminants. The filters are then regenerated or treated and disposed of as hazardous waste.

The air-stripping system at WS1 continues to reduce the PCE concentration in the drinking water concentration to below detectable levels, thus eliminating the principal threat posed to human health from exposure to PCE in drinking water. This remedy is a proven technology for removal of PCE from drinking water and is cost effective. The air-stripping system at WS1 currently remains operational and, in order to ensure long term effectiveness, will remain in operation as long as necessary to keep drinking water PCE concentrations in WS1 below 5.0 μg/L at the tap.

No ongoing source for the PCE in the groundwater at WS1 was identified. Therefore, the remedy focused on treatment of the drinking water and represented the maximum extent to which a permanent solution and treatment technology could be used in a cost-effective manner. Even though PCE sources were not controlled, the concentration of PCE in groundwater at WS1 is expected to eventually decrease to a level below the MCL. The selected remedy also includes

monitoring, by the City of Vancouver, to evaluate system effectiveness at removing PCE from both groundwater and drinking water. No Institutional Controls were necessary as part of the remedy selected in the ROD at WS1.

Vancouver Water Station 4

Similar to WS1, EPA selected the City of Vancouver's previously implemented air stripping treatment system to reduce PCE concentrations in groundwater and drinking water below the MCL. No ongoing sources for the PCE in the groundwater at WS4 were identified for which cleanup action could be taken, so the remedy focused on treatment of the drinking water produced from WS4. PCE concentrations in groundwater at WS4 are also expected to eventually decrease to a level below the maximum contaminant level (MCL). The selected remedy is monitored to evaluate system effectiveness at removing PCE from both groundwater and drinking water.

During the initial design of the air strippers, the concentration of PCE at WS4 was consistently in the range of 5 to 20 μg/L, so the stripper design was based on maximum expected concentrations of 100 μg/L. During 1991, the concentration of PCE increased rapidly to over 1000 μg/L in a private well located approximately 200 yards northeast and upgradient of the wellfield. Because of this increase, the two stripping towers, originally designed to run in parallel and to treat 8000 gallons per minute, were re-configured to run in series. The design change reduced the total flow to 4000 gpm, but enabled the system to remove much higher concentrations of PCE. No Institutional Controls were necessary as part of the remedy selected in the ROD at WS4.

Remedy Implementation

Air stripping has a well-established history as an effective means of treating water contaminated with VOCs. Air stripping systems are relatively simple to design and straightforward to maintain. Start-up and shut-down can be accomplished quickly, and the modular design makes an air stripping system easy to construct.

Vancouver Water Station 1

The air stripping system at WS1 has been in operation since 1993, before the site was listed on the National Priorities List. This system consistently reduced concentrations of PCE in treated water to below the level of detection. This action addressed the ingestion of PCE in contaminated drinking water, the principal threat to human health.

All water pumped at WS1 is treated by air stripping and distributed to customers as drinking water. Groundwater is pumped from WS1 at a rate that varies between 8 and 19 million gallons per day, depending on the time of year and customer demand.

The selected remedy ensures a high degree of certainty that the remedy will be effective in the long term because of the significant reduction of the contamination in the water that has been

achieved through use of the existing air stripping system. No other treatment options were evaluated because the existing system was already in operation when the site was listed on the NPL and the technology has proven to be effective for removal of VOCs from water. For reasons previously described, source removal was not part of the selected remedy. Periodic monitoring of the groundwater has been performed by the City of Vancouver to evaluate the effectiveness of and the need for continued operation of the treatment system at WS1.

Vancouver Water Station 4

All water pumped from WS4 is treated by air stripping and distributed to customers as drinking water. The rate at which groundwater can be pumped from WS4 is limited by the rate at which the air stripping treatment can treat the water (4000 gallons per minute (gpm)) which is equivalent to a maximum of approximately 2.75 million gallons per day. The actual production rate is based on demand and was generally considerably less. While the primary purpose of air stripping is to cleanup the water being produced for distribution as drinking water, this action also serves as a pump-and-treat remedy that addresses the contamination of the groundwater at the site. Source removal is not part of the selected remedy.

Similar to WS1, periodic monitoring of the groundwater has been performed by the City of Vancouver to evaluate the effectiveness of and the need for continued operation of the treatment system at WS4. Groundwater monitoring consists of sampling production wells and monitoring wells for PCE and other VOCs. The City of Vancouver is responsible for monitoring the water at WS4 and has sampled each year from each active production well. EPA is responsible for reviewing the City's data annually.

Decisions on whether to continue and/or modify the monitoring program will be made by EPA in conjunction with the City of Vancouver.

System Operation/Operation and Maintenance

Vancouver Water Station 1

The air stripping system at WS1 cost approximately $4 million to design and build. Operating costs were estimated in the ROD to be approximately $60,000/year. Implementation of the remedy from 1999 to present would result in a total operation and maintenance cost of $300,000**.** The City of Vancouver concurs with this estimate.

Vancouver Water Station 4

The air stripping system at WS4 cost approximately $5 million to design and build. Operation costs were estimated in the ROD to be approximately $230,000/year. Implementation of the remedy from 1999 to present would result in a total operation and maintenance cost of $1,150,000. The City of Vancouver concurs with this estimate.

V. Review of Findings

Five year Review Process

Administrative Components

EPA is the lead agency for this 5-year review. The Vancouver Water Station #1 & #4 five year review team was led by Nancy Harney of EPA, Remedial Project Manager (RPM) for the Vancouver Water Station #1 & #4 Site. Bernie Zavala, EPA staff Hydrogeologist and Ravi Sanga, Superfund Remedial Project Manager, also assisted in the review.

Community Involvement During the 5 year review

EPA published a public notice in the May 13, 2003, *Vancouver Columbian* that the 5 year review was underway. The public notice announced the 5-year review process and provided an opportunity for the public to submit comments or concerns. No comments or concerns were received by the general public regarding the 5 year review for either waterstation. Copies of the final 5-year review report will be placed in the local site repositories at the City of Vancouver public library as well as on the EPA Region 10 website (www.epa.gov/r10earth). Given the lack of public response from the 5 year review advertisement, EPA determined that a public meeting for the Vancouver Water Stations #1 & #4 was not warranted at this time.

Document Review

This five year review consists of a review of RODs for both WS1 and WS4, preliminary closeout reports of WS1 and WS4 and City of Vancouver groundwater monitoring well data and tower influent and effluent data.

Data Review

Vancouver Water Station 1

Ground water samples were collected by the City of Vancouver from the Production Wells within the wellfield from June 1991 to February 2003 (Appendix C). A review of this data indicated that concentrations of PCE were at the highest levels in groundwater in 1993 (well #1, 14 µg/L). Air stripping towers, constructed in May of 1993, reduced PCE concentrations in water distributed as drinking water (0.4 µg/L) to levels below the drinking water PCE MCL. In 1994, groundwater levels of PCE in well # 1 (6.2 µg/L, 6/6/94) remained above the MCL, leading to WS1's NPL listing. Groundwater monitoring from the past 5 years indicated that on average PCE levels were below the EPA MCL. However, recent groundwater monitoring (Feb 3, 2003) by the City of Vancouver still revealed that PCE groundwater concentrations are above the MCL in well #1 of WS1 (7.9 µg/L).

Vancouver Water Station 4

Ground water samples were collected by the City of Vancouver from the Production Wells within the wellfield at WS4 from June 1988 through Feb 2003. A review of this data indicated that PCE concentrations were the highest in 1993 from a private well in a the trailer park near the vicinity of WS4 (1500 μg/L). In July 2003, measured effluent from the south air stripping tower in WS4 did show PCE concentrations to be below the MCL, although on one occasion effluent concentrations from the South Tower were above the MCL (11.8 μg/L, 11/09/98). The cause for this elevation is unknown. However, although the elevation was present in the south tower effluent, the south and north air stripping towers operated in series from 1998-2001. This allowed the effluent from the south tower to undergo additional air stripping in the north tower, resulting in non-detect tap water PCE concentrations. Since August 2001, two groundwater production wells (well 2B and well 5) have been treated through the south tower and the north tower has been taken out of service. All other production wells have been sampled but not used for drinking water distribution. Although the air strippers reduced the PCE concentration in drinking water to protective levels, monitoring data shows that during the past 5 years, groundwater concentrations remain above the MCL for PCE.

Five Year Review Site Inspection and Sampling

An inspection at the Site was conducted on July 1, 2003, by EPA Project Managers, Nancy Harney and Ravi Sanga. Ground water and air stripping tower influent and effluent samples were collected by EPA's Hydrogeologist and Field Staff, Bernie Zavala and Dave Terpenning and the City of Vancouver Water Treatment Plant Operator, Ed Heidt. The air stripping towers at WS1 receive a combined influent from a holding reservoir. When the reservoir is full, no influent is drawn from the individual production wells and therefore, it is not possible to sample the influent. At the time of the July 1 sampling event, the reservoir at WS1 was full and influent samples from WS1 could not be obtained.

EPA sampled groundwater from the production wells of WS1 and WS4, influent from WS4 and effluent from treatment towers for both water stations, a private well and one monitoring well, both from WS4. To be protective of human health, all VOCs were analyzed with this sampling effort. The purpose of the inspection was to sample groundwater and analyze VOC concentrations, assess the protectiveness of the remedy and determine whether the air stripping towers were operating and functional.

No significant issues were identified regarding the air stripping towers of WS1 and WS4.

VII. Technical Assessment

Question A: *Is the remedy functioning as intended by the decision documents?*

The results of the Site inspection and review of documents, ARARs and risk assumptions, indicates that the remedy is functioning as intended by the ROD. The air stripping towers are continuing to reduce PCE concentration in drinking water to concentrations below the MCL for PCE or essentially to non-detect concentrations. The remedial action objective of removing PCE from the drinking water supply and reducing the concentration of PCE in groundwater is still

being accomplished by the air stripping towers at Vancouver WS1 & WS4.

Appendices C showed a drop in groundwater PCE concentrations below the drinking water MCL after 1996 from most production wells sampled by the City of Vancouver for WS1. Production well 7 showed an increase in groundwater PCE concentrations after 1997, however, concentrations fell below the MCL by the end of the monitoring period. During the sampling period, before the implementation of the air strippers, groundwater PCE concentrations were not above the MCL. Air stripping reduced the PCE levels to non-detect.

Appendices C showed a steady decline in groundwater PCE concentrations after 1993 in most production wells sampled by the City of Vancouver for WS4 Well number 1 showed a high spike in 1999, however, levels returned to a downward trend following this event. Sampling from the trailer park Mercer Well, in the vicinity of WS4, showed a decline in groundwater PCE after 1992. The well pump was shutdown in 1996 and sampling at the Mercer well by the City of Vancouver stopped as a result. Data sampled after 1998 shows that PCE concentrations from effluent from the North Tower were below the MCL.

Operation and maintenance of the air stripping towers has also been effective. The City of Vancouver is maintaining the air stripping towers in accordance with the ROD and O&M plan. O&M annual costs are consistent with original estimates and there are no indications of any difficulties with the remedy. There is a permit for air emissions issued by the Southwest Air Pollution Control Authority associated with operating the air stripping towers for WS1 and WS4. This permit is still valid and the City of Vancouver states that they are in compliance. The Southwest Air Pollution Control Authority, presently the Southwest Clean Air Agency, also concurred that the City of Vancouver is in compliance with the permit.

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*

At the time of the ROD remedial action objectives for WS1 and WS4 were to protect human health by reducing concentrations of PCE in drinking water produced from WS1 to below the MCL specified in regulations promulgated under the federal Safe Drinking Act (SDWA) and in the state drinking water regulations. An additional remedial action objective for WS1 and WS4 was to protect human health by reducing PCE and concentrations to below the Method A cleanup level specified in the Washington State Model Toxics Control Act (MTCA) regulations and below the federal and state drinking water standards which are 5.0 μg/L.

There has been no change to the Washington State drinking water MCL for PCE. None of the assumptions used in the risk assessment relied upon for remedy selection have changed such that protectiveness of the remedy would be called into question. The baseline human health risk assessments for WS1 and WS4 were completed in accordance with EPA's risk assessment guidance. No potentially complete and/or significant exposure pathway to contaminants in groundwater were identified for ecological receptors at the time of the ROD. Therefore, potential ecological risk was considered minimal. At the time of this review this consideration has not changed.

The receptors evaluated with the human health risk assessment included 1) public water supply users who are currently exposed to treated water, 2) public water supply users who could be exposed to untreated water in the future if air stripping treatment were to be discontinued or if private water supply wells were to be used for drinking water, 3) site workers and 4) nearby residents and recreational workers. At the time of this review, the affects of the remedy on PCE exposure to these receptors are discussed as follows.

1) *Public water supply users who are currently exposed to treated water.*

The air stripping towers continue to reduce the level of PCE in drinking water to below detection levels. Therefore, people who presently rely on WS1 and WS4 for drinking water will not be exposed to PCE through the oral ingestion route.

2) Public water supply users who could be exposed to untreated water in the future if the air stripping treatment were to be discontinued or if private water supply wells were to be used for drinking water

Groundwater PCE concentrations are still above the MCL in individual wells for both WS1 and WS4. If the selected air stripping remedy is discontinued, the public will face unacceptable exposures and risk from PCE concentrations in untreated drinking water. Therefore, the air stripping treatment will continue until the extraction of groundwater flushes out residual PCE contaminants in the wellfield. The time to achieve this remedial action objective is not known.

3) Site workers

At the time the ROD was written, significant dermal exposures to untreated water by site workers was not expected to occur. Currently, water is still transported through the water station and treatment units via pipes, making direct contact with untreated water by workers unlikely.

4) Nearby residents and recreational visitors

In 1993, an air permit was issued to the City of Vancouver by the Southwest Air Pollution Control Authority for stack or fugitive emissions from the air strippers. The combined air PCE emissions from the air stripping columns were controlled by five granular activated carbon canisters, and will not result in ambient air concentrations of PCE in excess of the applicable regulations to nearby residents of WS1 and WS4 and recreational visitors in the vicinity of the wellfields.

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy or adversely affect nearby residents and recreational visitors. Regular groundwater monitoring is being conducted by the City of Vancouver to evaluate groundwater quality. There have been no significant changes in ARARs and no new standards affecting the protectiveness of the remedy.

Question C: *Has any other information come to light that could call into question the*

protectiveness of the remedy?

Some industrial solvents used with fabric cleaning are commonly formulated with additives to enhance their performance. These additives or solvent stabilizers can prevent solvent breakdown and inhibit reactions that could degrade solvent properties. 1,4-dioxane has historically been included with 1,1,1-trichloroethane (TCA), trichloroethene (TCE) and in some cases PCE. Therefore, 1,4-dioxane is becoming an issue at some public water supplies contaminated with volatile organics. 1,4-dioxane is not significantly removed by conventional pump and treat technologies such as air stripping and carbon adsorption and is generally resistant to biodegradation. Because of the potential carcinogenicity of 1-4, dioxane, and in order to assure protectiveness of the remedy used to remove PCE from WS1 and WS4, EPA decided to check for the presence of 1,4-dioxane at both WS1 and WS4 in 2003.

For the five year review, EPA sampled groundwater at selected production wells and monitoring wells at both well fields in June 2003. The groundwater samples were analyzed for all VOCs including PCE, TCE, and 1,4-dioxane. 1.4-dioxane was not detected in any of the samples taken for this 5 year review.

Table 1, shows the results from recent EPA's ground water sampling from WS1 and WS4, June 2003.

Date	Sample location	Analytical Parameters (µg/l)		
		TCE	PCE	1,4 Dioxane
6/30/03	WS1-1	0.55 J	22.3	0.2 U
	WS1-1 (duplicate)	0.52 J	21.9	0.2 U
	WS1-7	0.91 J	6.2	0.2 U
	WS1-4	1.0 U	1.8	0.2 U
	WS1-11	0.72 J	0.80	0.2 U
	WS1-effluent	1.0 U	1.0 U	0.2 U
6/30/03	WS4-5B	1.0 U	9.1	0.2 U
	WS4-5B (duplicate)	1.0 U	9.1	0.2 U
	WS4-9	1.0 U	16.5	0.2 U
	WS4-3B	1.0 U	18.7	0.2 U
	WS4-influent	1.0 U	13.6	0.2 U
	WS4-effluent	1.0 U	1.0 J	0.2 U
	Mercer Well	1.0 U	10.3	0.2 U
7/01/03	WS4-MW4-7	1.0 U	9.5	0.2 U

U - not detected at that detection limit；J- estimated value

TCE- Trichloroethene; PCE- Tetrachloroethene
TCE/PCE DL - 1 µg/l, 1,4 Dioxane - 0.2 µg/l
TCE/PCE MCL 5µg/L

No other information calling into question the protectiveness of the remedy was identified during the five year review.

Technical Assessment Summary

According to the Site inspection and documents and data reviewed, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. ARARs for drinking water and groundwater standards for PCE concentrations cited in the ROD have been met. No changes in the toxicity factors for PCE were identified since the ROD was issued. No other information was identified during the five year review that calls into question the protectiveness of the remedy.

VIII. Issues

None

IX. Recommendations and Follow-Up Actions

Concentrations of PCE in effluent samples were below the MCL, however, groundwater PCE

concentrations were above the MCL in groundwater production wells for both WS1 and WS4. EPA sampling, for the 5 year review revealed that WS1 concentrations of PCE were higher when compared to historical sampling by the City of Vancouver. Additionally, trichloroethylene (TCE), was also detected in groundwater samples from WS1. Given the higher concentrations of PCE and the presence of TCE in WS1, continued implementation of the air stripping remedy is recommended for both WS1 and WS4. Also, since TCE is a metabolite of PCE, to ensure protectiveness, continued TCE monitoring is recommended. 1,4-dioxane was not detected in any of the samples from monitoring wells at WS1 and WS4. However, because 1,4-dioxane is often associated with solvent contamination and can pass through air filtration towers, to be protective, it is recommended (Table 2) that monitoring of this compound occur periodically by the City of Vancouver.

Table 2. Recommendations and Follow-up Actions

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
Add monitoring for 1,4 - Dioxane and TCE to groundwater and effluent sampling plan.	City of Vancouver	EPA	Next 5 year review (2008). First 2 years sample quarterly. Next 2 years bi-annually, following year annually.	No	Yes

X. Protectiveness Statement

The remedies for Vancouver WS1 and WS4 are protective of human health and the environment. Long-term protectiveness of the remedial action will be verified by regular groundwater monitoring by the City of Vancouver. Current information indicates that the remedy is functioning as required.

XI. Next Review

The next five year review for the Vancouver Water Station #1 & #4 Superfund Site is required by September 2008, five years from the date of this review.

APPENDICES

A. List of Documents Reviewed

B. Site Map Vancouver WS 1, WS4
C. Charts

Appendix A

List of Documents Reviewed

Record of Decision, Vancouver Water Station #1, US Environmental Protection Agency, September 1998.

Record of Decision, Vancouver Water Station #4, US Environmental Protection Agency, September 1999

Preliminary Closeout Report, Vancouver Water Station #1, US Environmental Protection Agency, September 1998

Preliminary Closeout Report, Vancouver Water Station #4, US Environmental Protection Agency, September 1999

Decision Memorandum, Decision Not to Take List Recovery Action/Vancouver Water Station #1 & #4 Vancouver, WA

Trip Report-Ground water sampling at the City of Vancouver's Water stations 1 and 4, US Environmental Protection Agency, Region 10, September 2003.